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ABSTRACT

This instructor's lesson plan guide on general pharmacology is one of fifteen modules designed for use in the training of emergency medical technicians (paramedics). Five units of study are presented: (1) the sources of drugs, drug names, solids and liquids, and the different forms in which drugs may be dispersed; (2) the action (effects) of drugs; (3) the metric system and how to calculate drug dosages; (4) safety considerations and procedures when administering drugs in the field; and (5) practice skills in drawing up solutions in a syringe and making intravenous injections, subcutaneous injections, and intramuscular injections. Each unit contains these elements: behavioral objectives; teaching procedures, a content outline, demonstration outlines, list of needed equipment and materials, and guidelines for activities to be performed by students applying the skills. Skill evaluation sheets are provided. It is suggested that each module can be presented individually or combined with other modules to construct a course for a selected group of students. (CE 017 514 is a course guide for use in program planning and administration of the modules.) (JH)

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National Training Course
EMERGENCY MEDICAL TECHNICIAN
PARAMEDIC
INSTRUCTOR'S LESSON PLANS

Module – IV
General Pharmacology

CE 017 518

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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U.S. Department of Transportation / *National Highway Traffic Safety Administration*

National Training Course

EMERGENCY MEDICAL TECHNICIAN
PARAMEDIC
INSTRUCTOR'S LESSON PLANS

Module – **IV**

General Pharmacology

U.S. Department of Transportation / National Highway Traffic Safety Administration

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CE 017 518

HOW TO USE THE INSTRUCTOR LESSON PLANS

NOTES

The *Instructor Lesson Plans* are guides for teaching an advanced-level training program for emergency medical technicians. The *Plans* cannot be used by the instructor to develop the competency to conduct the program; the instructor should have this as a prerequisite to teaching the course.

The *Instructor Lesson Plans* are comprised of 15 modules, each containing the information and instructions needed to conduct a program on a particular subject. Each module can be used by itself or in concert with other modules.

Each module is subdivided into instructional units that deal with a particular segment of the module subject. Generally, the units contain the following components:

- *Performance Objectives.* These are classified as knowledge (K) objectives or skill (S) objectives. They are written in behavioral terms so they can be evaluated either through observation of student activities or through results obtained under specified conditions.
- *Unit Activities.* Reading assignments, reference materials, and outside activities are presented for both the students and the instructor. If the activities are identical, only the instructor's activities are presented.
- *Equipment and Materials.* Educational equipment includes chalkboard, overhead projector, slide projector, and screen. Medical equipment and materials required are drawn from those listed in Appendix F of the *Course Guide*.

- *Content Outline.* This presents the topics to be covered during the presentation of the unit. Where appropriate, it is divided into single skills or concepts. This approach gives the instructor the flexibility to add or delete specific skills and information. The content outline also provides directions to the instructor indicating when the use of demonstrations or group discussions would be most appropriate.

  Because the units are designed to be taught by technically competent instructors, the content outlines are not specific; they only enumerate topics and subtopics. It is expected that the instructor's skill and knowledge will supplement the depth of the course content outline. The instructor is encouraged to prepare additional notes.

- *Demonstration Outlines.* These are designed to present procedural steps that are important in performing the particular skill or calculation. Steps that are critical or that may lead to common errors are emphasized. Where critical steps exist, these outlines suggest what should be demonstrated.
- *Practice Sessions.* These sessions serve as guides to activities to be performed by students applying the skills. They may be performed in the classroom or assigned as homework. During classroom practice sessions, the instructor will be available to observe and correct student performance and to answer any questions.
- *Skill Evaluations.* The skill evaluation sheets provide checkpoints for the instructor to use to insure that students are following appropriate procedures or sequences. Skill evaluation sheets also provide a convenient method for feedback to students having particular problems with a given skill, and for monitoring a student's progress in attaining skill objectives.

  The skill evaluation should occur only after the students have had an opportunity to practice the skill under the supervision of the instructor. The skill evaluation sheets can be distributed during, or before, the demonstration or practice session. Thus, they can be used as a job aid during practice. They should not be used, however, as a job aid while the student is being evaluated. The sheets are designed to provide a learning and evaluation tool

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and are not intended to mandate performance in the field in a set manner, irrespective of the patient's condition or situation.

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Satisfactory performance of a given skill is defined as the correct performance of all steps in the proper sequence. The instructor's judgment is required to define correct performance and sequence of steps in a skill. Skill evaluations may be repeated at intervals throughout the course to assess skill decay and the need for remedial practice. Some instructors may wish to test skills immediately after they have been learned and again at the conclusion of the course.

The alphanumeric coding system is used to identify the various modules and units. When you see, for example, in Module II, **3.6.1.K**, the **3** indicates the unit, the **6** indicates the main instructional topic, the **1** indicates the subsection of the major topic outlined in **3.6**, and the **K** indicates the teaching objective (in this case, knowledge).

To illustrate further, **3.6.1.K** would translate into:

3 = Unit number
6 = The main topic of the instructional section (The first two numbers—e.g., **3.6**—refer to a major heading in the unit content outline.)
1 = A subsection of the major topic outlined in **3.6** (This number relates to the number of objectives listed under skill or knowledge objectives and not to the content outline.)
K = Knowledge objective
S = Skill objective

The three-digit reference numbers (e.g., **3.6.1**) within each module refer to the topical section in that module only. For example, in Module II, any topical heading with **3.6** as the first two digits refers to the discussion of the components of patient assessment in Unit 3.

A visual presentation of Unit 3, by Module II, of the coding system is presented on the following pages.

SAMPLE PAGE

CODING SYSTEM EXAMPLES

NOTES

- Abdomen
- Extremities

3.6.1.K Given a situation describing a patient with a possible illness or injury who may or may not be able to communicate, the student should be able to describe the procedure for evaluating the patient described. Minimally, the student should include the appropriate primary assessment and specify the order of the four components of the secondary assessment and the areas of the assessment that would be emphasized.

the demonstration, auscultation of the lung, heart, and abdominal sounds.

3.6.1.S Given a student posing as a communicative patient, the student should be able to demonstrate the procedure for conducting a patient assessment when the patient is suspected of having the following:

SAMPLE PAGE

CODING SYSTEM EXAMPLES

NOTES

8. Practice Session 3

3.6. Four components of assessment (order)

A. If the patient can communicate, determine if he has a medical or trauma-related problem.

1. If a medical problem, the general order should be:
   a. Evaluate the diagnostic and vital signs.
   b. Develop the patient's history.
   c. Examine for a medical problem.

Skill Evaluation 3.6.1.S: Assessment of a Communicative Patient With a Suspected Trauma-Related Problem

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Student posing as a victim
Stethoscope

Clinical Training

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To present this program, it will be necessary to have access to the clinical units listed below. If a unit is not available, adjustments should be made to insure that the activities proposed for that unit are included in others. Specific guidelines for the clinical units are included in the modules. The student's training should be supervised in each of the following clinical areas:

- Emergency department
- Intensive care unit/coronary care unit
- Operating/recovery room
- Intravenous (IV) team
- Pediatric unit
- Labor suite/delivery room/newborn nursery
- Psychiatric unit
- Morgue
- Mobile intensive care unit

Sample forms for maintaining student activity records are included in the *Instructor Lesson Plans*. The forms are designed so that the medical director can determine the number of times, and how successfully, a student has performed a skill. The medical director also will be able to determine how much time the student needed to become proficient in the skill. Further, the medical director will be able to evaluate student performance under a number of preceptors, because certain skills are repeated in various clinical units (e.g., initiating an IV is performed by the student with the IV team and in the emergency department and intensive care unit).

Although the clinical experience is listed with the module, it need not be presented each time, even if a number of modules are being presented.

Testing and Evaluating the Student

It is recommended that each student be evaluated on proficiency of skill and knowledge at the completion of each module. Skill evaluation sheets have been provided for each skill in each unit. These sheets can be used as guides for evaluating the student's skill proficiency. The evaluation of the knowledge objectives is left to the discretion of the instructor, according to predetermined objectives.

Testing of knowledge should stress areas of clinical relevance over basic science. No matter what type of evaluation system is used, students should be kept informed of their progress and should be given additional activities to supplement weak areas.

As previously stated, the emphasis is on student competency, rather than on the total number of hours the student is involved in the program. Thus, it is possible for the student to be tested and given credit for any module. The medical director should not assume the student's competency simply because of prior training, but should develop an evaluation method to determine the student's proficiency based on first-hand observation and experience. With this type of method, it is possible for students to receive credit for prior training experience. This would be especially applicable for those modules that are primarily a review of skills concerned with Emergency Medical Technician-Ambulance; for example, soft-tissue injuries and rescue.

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MODULE IV GENERAL PHARMACOLOGY

INTRODUCTION

Prerequisites

The students must have successfully completed the following modules:

I. The Emergency Medical Technician, His Role, Responsibilities, and Training

II. Human Systems and Patient Assessment

III. Shock and Fluid Therapy

Description of Module

Following is a summary of the topics discussed in this module:

Unit 1. Drug Information: Discusses the sources of drugs, drug names, solids and liquids, and the different forms in which drugs may be dispensed.

Unit 2. Action of Drugs: Discusses local and systemic effects, factors influencing the action of drugs, special terms to describe drug actions, for example, therapeutic action, physiological action, cumulative action, and tolerance. In addition, this unit discusses those drugs affecting the autonomic nervous system (alpha and beta agents). The unit also contains a list of items that the students should know about any drug before using it.

Unit 3. Weights and Measures: Discusses the metric system and how to calculate drug dosages (fractional dosages). In this unit, the students are given a homework assignment dealing with the metric system.

Unit 4. Administration of Drugs: Discusses safety considerations and procedures when using drugs in the field. This unit also allows time for discussing local procedures in the administration of drugs.

Unit 5. Techniques of Administration: Designed to give the students an opportunity to practice the following skills in an educational setting:

- Drawing up solutions in a syringe
- Intravenous injections (IV push and adding medication to an IV container)
- Subcutaneous injections
- Intramuscular injections

These skills should not be attempted in the field until the students have completed the clinical module.

This module was not designed to expose the students to specific drugs. The students should be informed that specific drugs and their effects will be discussed in other modules.

Clinical Experience

The student should receive experience in the clinical units calculating dosages and administering subcutaneous and intramuscular injection. This experience can be gained in any clinical area of the hospital and, as with all clinical activities, should be performed under the direction of a preceptor.

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UNIT 1 emt-p

DRUG INFORMATION

NOTES

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

1.2.1.K Given a list of possible sources, the student should be able to select the sources of various drugs (e.g., animal, vegetable, mineral, synthetic).

1.2.2.K Given a list of statements, the student should be able to select those statements that are true about synthetic drugs.

1.3.1.K Given a list of statements, the student should be able to select those statements that are true about the various names of a drug (i.e., generic vs. trade name).

1.3.2.K Given a specific drug name and a list of different types of names (official, chemical, generic, trade), the student should be able to select the type of name that is given.

1.4.1.K Given a list of statements, the student should be able to select those statements that describe or explain why drug standards are necessary.

1.4.2.K Given a list of agencies and their function, the student should be able to identify those agencies that are responsible for regulating drugs.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

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1.5.1.K Given a list of various definitions, the student should be able to select the definitions of:

- Capsules
- Powders
- Pills
- Tablets
- Ampules
- Vials
- Suppositories
- Ointments
- Lozenges
- Solutions
- Fluid extracts
- Tinctures
- Spirits

1.5.2.K Given a list of statements, the student should be able to select those statements that are true about suspensions.

1.5.3.K Given a list of pharmaceutical preparations, the student should be able to select those that are (usually) used externally.

1.6.1.K Given a list of pharmaceutical preparations, the student should be able to select those that are prepackaged and have a given dosage.

Instructor Activities

Assign the materials referred to below during the class period immediately before the beginning of this unit:

- Chapter 4, Unit 1, of the *Text*
- Knowledge objectives for this unit

Prepare a lecture following the content outline on page IV-5. The following are suggestions:

- Inform the students that there are no practice sessions or demonstration sessions.
- Start the lesson by asking the students to list on the blackboard the advantages and disadvantages of using drugs in the field (limit the discussion to 3–5 minutes).
- Discuss Section 1.2, having the students list the four sources of drugs on the blackboard. Try to have examples from each source.

- Discuss Section 1.3, using a lecture/discussion method. During the lecture, it might be advisable to have the students distinguish the various names, when given a specific name.
- Discuss section 1.4. Have a copy of the United States Pharmacopoeia (USP) to show the students. Drug legislation need not be a time-consuming affair. This section is only included so the students will realize the need for regulatory agencies.
- Discuss Section 1.5, using a lecture/discussion method. Ask the students to name solid and liquid drugs. Have examples available to show the students.

Evaluate the students on their attainment of the objectives for this unit at the end of the module.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Equipment—Medical

Examples of drugs coming from the four sources
Examples of drugs in given forms (e.g., capsules, tablets, etc.)
Ampule and vial
Physicians' Desk Reference

Materials

Knowledge objectives (optional)
Text

Content Outline

1.1. Introductory remarks

The importance of medications and the dangers associated with drug administration

1. Discuss the definition of a drug.
2. Discuss the advantages and disadvantages of using drugs in the field.

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3. Discuss the importance of knowing:
   a. Effects of drugs
   b. Proper dosages
   c. Contraindications
   d. Side effects
   e. Administration techniques (mode and rate)
4. Distribute behavioral objectives for this unit and discuss them, if not already done.

NOTES

1.2. Sources of drugs

A. Four major sources
   1. Animal
   2. Vegetable or plant
   3. Mineral
   4. Synthetic

B. Animal
   1. Give examples (thyroid, insulin, or epinephrine).
   2. Give locations of sources (e.g., thyroid comes from thyroid gland in the neck of any food animal; insulin from animal's pancreas).

C. Vegetable
   1. Discuss sources (medicinal plants).
      a. Dried roots
      b. Bark
      c. Sap
      d. Leaves
      e. Flowers
      f. Seeds
   2. Give examples (digitalis is from dried leaves of wild-flower called purple foxglove; opium is from poppies).

D. Mineral
   1. Discuss sources.
      a. Metallic and nonmetallic
      b. Forms of acids, bases, and salts
   2. Give examples (calcium is found in animal bones and teeth).

E. Synthetic
   1. Discuss the process: building up a compound by the union of simpler compounds or elements.
   2. Point out that it is a newer source than the others.

3. Point out that most medicines can now be made synthetically.
4. Give examples (synthetic steroids, vitamins).

1.3. Drug names

A. Discuss that a drug may have four names.
   1. Official
   2. Chemical
   3. Generic
   4. Trade

B. Discuss the official name.
   1. Point out that it is the name under which the drug is listed in official publications.
   2. Point out that it is as specified in the USP.

C. Discuss the chemical name.
   1. Point out that it is a detailed denotation of the chemical constitution of a drug.
   2. Give examples.

D. Discuss the generic name.
   1. Point out that it is given this name before it becomes the official name.
   2. Point out that it is usually derived from the chemical name—but simpler.
   3. Point out that it is not capitalized.
   4. Give examples.

E. Discuss the trade or proprietary name.
   1. Point out that it is the name registered by the company and restricted to its use.
   2. Point out the symbol ® at the upper right of the name (indicates registration).
   3. Point out that the first letter is capitalized.
   4. Examples:
      a. Nembutal—sleeping capsule: official name—pentobarbital
      b. Tetracyn V, Tetracyn, etc.

F. Give examples of all four names of a single drug.

1.4. Drug standards and legislation

A. Reasons for standards
   1. One reason is to insure the uniformity of drug strength, purity, and identification.

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2. USP

(Note: Have the publication available for students to look at.)

a. Legal standard set forth by Federal Food, Drug, and Cosmetic Act of 1938.

B. Drug legislation

1. Its purpose is to protect consumers and patients.
2. Brief history
   a. Pure Food Act of 1906
      (1) Requires labeling
      (2) Regulates the traffic of drugs
   b. Federal Food, Drug, and Cosmetics Act of 1938, 1952, 1962
      (1) Overseen by the Food and Drug Administration of the Department of Health, Education, and Welfare (HEW)
      (2) Regulates the labeling of dangerous drugs
      (3) Determines the safety of drugs
      (4) Regulates the manufacturing of drugs
   c. Harrison Narcotic Act of 1914—amended several times
      (1) Regulates opium, cocaine, their compounds and derivatives, and many other drugs
      (2) Requires record keeping by distributors registered with the Department of Revenue
   d. Narcotic Control Act of 1956
3. Federal regulatory agencies (give the function of each)
   a. Bureau of Narcotics and Dangerous Drugs (BNDD)
   b. Food and Drug Administration (HEW)
   c. Public Health Service
   d. Federal Trade Commission

1.5. Drug forms (Note: Have examples for the students to look at.)

A. Solid drugs (most drugs are prepared in solid forms)

1. Extracts
   a. Solid preparation of drugs obtained by dissolving the crude drug in alcohol or water. The solution is then allowed to evaporate. The sediment that is left is called the extract.

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b. They are usually four or five times stronger than crude drugs.
c. Extracts have the ability to be incorporated into tablets or capsules.
d. Example: cascara tablets, a laxative

2. Powders
   a. Crude or other drugs ground into a powder and used in that form
   b. Example: aspirin powders—used as a gargle for sore throats
3. Pills
   a. Drugs shaped into spheres or ovals
   b. Usually coated to disguise the unpleasant taste of a drug or to preserve the potency
4. Capsules
   a. Drugs in small cylindrical gelatin containers that disguise taste of drug
   b. Provide a long, continuous period of absorption and effect
   c. Example: pentobarbital (Nembutal)
5. Tablets
   a. Dried, powdered drugs that have been compressed into small disks (usually easily dissolved)
   b. Example: aspirin
6. Pulvule
   a. Is a container with a dose of powdered drug
   b. Shaped like a capsule, but it is not made of gelatin and will not separate as a capsule does

B. Not solids or liquids
1. Ampule (or ampoule)
   a. Point out that it is a glass container.
   b. Point out that it is simply a container for drugs.
   c. Point out that the drug in an ampule can be liquid or powder.
   d. Point out that it is sealed to avoid contamination by bacteria or dust.
   e. Point out that it is used for drugs given by injections.
   f. Show an ampule.
2. Vial
   a. Point out that it is a glass container with a rubber stopper.

NOTES

b. Point out that it usually contains multiple doses.

3. Suppositories
   a. Point out that they are mixtures of drugs with a firm base such as cocoa butter and are molded into shapes suitable for insertion into a body orifice.
   b. Discuss types
      (1) Rectal
      (2) Vaginal
      (3) Urethral
   c. Point out that they usually melt at body temperature.
   d. Give example—Dulcolax (drugs to move bowels).
4. Ointments
   a. A mixture of drugs in a fatty base, such as:
      (1) Petrolatum
      (2) Lanolin
   b. Soft enough to spread at room temperatures
   c. Effects
      (1) Soothing
      (2) Astringent
      (3) Bacteriostatic
   d. Example: zinc oxide ointment
5. Troches or lozenges
   a. Flat, round, or rectangular discs consisting of a drug made up with sugar or any soothing (or demulcent) substance
   b. Example: cough lozenges

C. Liquid drugs
   1. Definition of solution—aqueous solutions—one or more substances dissolved in water
   2. Definition and examples of aqueous suspension
      a. It is a preparation of finely divided drugs, either intended for suspension in some liquid before use or already in suspension in suitable liquid; for example, aqueous penicillin (requires addition of sterile water and can be administered by IV).
      b. Suspensions are fluid mixtures that seem to stay together for a short time; the ingredients separate later.
      c. All bottles of suspensions need to be shaken well before administering.

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3. Fluid extracts
   a. They are concentrated fluid preparations of drugs made by dissolving the crude plant drug in the fluid that dissolves it most readily, for example, water or alcohol.
   b. They are usually 100 percent in strength—the most concentrated of fluid preparations.
   c. Example: extract of turpinhydrate.
4. Tinctures
   a. Diluted alcohol extracts of a drug—vary in strength from 10 to 20 percent
   b. Example: tincture of belladonna
5. Spirits
   a. Preparation of volatile (evaporating into vapor) substances dissolved in alcohol
   b. Example: spirits of ammonia
6. Syrups
   a. Drugs combined with sugar and water
   b. Example: syrup of ferrous sulfate—an iron medicine that overcomes anemia by increasing the iron available for the red blood cells
7. Elixirs
   a. Point out that they are palatable (or good-tasting) preparations of drugs made with alcohol, sugar, and some aromatic, or pleasant-smelling, substance.
   b. Example: terpin hydrate elixir
8. Milks
   a. Insoluble substances of drugs or preparations in water
   b. Should be shaken
   c. Example: milk of magnesia (an antacid)
9. Emulsions
   a. Point out that they are suspensions of oils, fats, or petrolatum in water. This suspension is made by means of an emulsifying agent such as gum acacia.
   b. Example: liquid petrolatum emulsion
10. Liniments
   a. Mixtures of drugs with soap, oil, water, or alcohol that are to be used for external application only
   b. Usually rubbed into the skin
   c. Example: chloroform liniment

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11. Lotions
    a. Point out that they are usually aqueous preparations that contain suspended matter.
    b. Point out that they are usually used for washes or soothing applications (usually applied to the skin by patting).
    c. Discuss the uses.
        (1) Cleansing
        (2) Astringent (drawing action)
    d. Point out the need to shake well before using.
    e. Example: calamine lotion

1.6. *Physicians' Desk Reference* (PDR)

A. Describe the purpose.
B. Describe the uses.
    1. Identifying unknown medications
    2. Learning more about a given drug

Summary

- Importance of drugs in the field and their dangers
- Sources of drugs
    - — Animal
    - — Vegetable
    - — Mineral
    - — Synthetic
- Drug names
    - — Official
    - — Chemical
    - — Generic
    - — Trade
- Importance of drug legislation and standards
- Drug forms (pharmaceutical preparations)
    - — Solids
    - — Liquids

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— Others not really solids and not really liquids
— Dosage (Note: Dosage is important. There is some convenience and safety in using prepackaged material.)
  a. Capsules
  b. Tablets
  c. Lozenges
  d. Pills
  e. Powders
  f. Ampules } containers
  g. Vials }

- *Physicians' Desk Reference*

NOTES

UNIT 2

emt-p

ACTION OF DRUGS

NOTES

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

2.1.1.K Given a list of definitions or statements, the student should be able to select those that are true about:

- Local effects
- General or systemic effects

2.2.1.K The student should be able to list those factors influencing the action of drugs, such as:

- Age of the patient
- Condition of the patient
- Dosage
- Absorption rate
- Distribution
- Elimination

2.2.2.K When given a list of methods of absorption (intravenous, subcutaneous, oral, transtracheal, intramuscular), the student should be able to rank the absorption rates from fastest to slowest.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

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2.2.3.K The student should be able to list at least five routes in which drugs are absorbed.

2.3.1.K Given lists of statements, the student should be able to select those that best describe the following labels:

- Depression
- Physiological
- Therapeutic
- Untoward
- Initiation
- Antagonism
- Cumulative effect
- Tolerance
- Synergism
- Potentiation
- Additive
- Habituation
- Idiosyncrasy
- Hypersensitivity
- Indication
- Contraindication
- Side effect

Or, given a list of statements or phrases, the student should be able to match the above labels with the statements.

Or, given a description of a situation or groups of situations, the student should be able to select the effect that best describes the situation. The effects may include all those listed above.

2.5.1.K Given a list of possible effects on the heart, lungs, and blood vessels, the student should be able to select those associated with alpha or beta agents.

2.5.2.K Given a list of statements, the student should be able to select those that are true about beta blockers.

2.5.3.K Given a list of statements, the student should be able to select those that describe what kind of receptors (alpha or beta) the heart, lungs, and arteries have.

2.5.4.K Given a specific situation (a patient's condition) and a list of drugs specified as pure alpha, pure beta, or both alpha and beta agents, the student should be able to select the appropriate drug for the specified condition.

2.6.1.K The students ought to be able to list at least nine items that reflect what they ought to know about a specific drug before using it. This list should contain:

- Dose
- Dilution
- Action
- Indications and use
- Precautions
- Incompatibility
- Contraindications
- Side effects
- Antidotes

Instructor Activities

Assign the material referred to below during the class period immediately before the beginning of this unit. Assignments include:

- Chapter 4, Unit 2, of the *Text*
- Knowledge objectives for this unit

Prepare a lecture following the content outline on page IV-18. The following are suggestions:

- Inform the students in the beginning of the unit that there are no demonstration sessions and no practice sessions.
- Inform the students in the beginning of the unit that this unit is designed only to give them an understanding of how drugs work. It is not designed to provide an understanding of the action of any specific drugs. Inform the students that specific drugs will be covered in future sections of the program.
- Discuss Section 2.1 of the outline using a lecture/discussion method.
- Discuss Section 2.2 of the outline using a lecture/discussion method. Ask the students to name those factors that would influence the action of the drugs.
- Discuss Section 2.3 of the outline using a lecture/discussion method. List the terms on the blackboard and define them.
- Inform the students that drugs can be classified by which body system they affect. Section 2.4 is designed primarily for this purpose. Further inform the students that in future modules, drugs will be discussed by the system they affect.
- Give the students some understanding of how drugs work by discussing Section 2.5. Perhaps the best way to discuss this

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section is to have the students take 20-25 minutes to read the section in the *Text* entitled "Drugs and the Autonomic Nervous System." After they have had an opportunity to do the reading, the instructor should answer any questions. During the question-and-answer period, it might be advisable to ask the students key or critical questions (such as, what is a beta agent?).

- Tell the students what key items they should know about a specific drug. Section 2.6 is designed to help the students with the modules that contain or discuss specific drugs.

Evaluate the students at the end of the module.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Equipment—Medical

None

Materials

Knowledge objectives (optional)
Text

Content Outline

2.1. Introduction

A. Importance of knowing action
   1. When to administer a drug
   2. What to observe after administered

B. Sites of action
   1. Local effects—result from the direct application of a drug to a tissue or organ and affect only a limited area. Includes drugs that act within the gastrointestinal tract, but that are not absorbed.

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2. General or systemic effects—take action after the drug is absorbed, usually involving absorption and distribution by the bloodstream. These affect the whole body.

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2.2. Factors that influence action of drugs

A. Age of the patient
B. Condition of the patient
C. Dosage (define each)
   1. Minimal
   2. Maximal
   3. Toxic
   4. Lethal
D. Absorption
   1. Process whereby drugs enter the bloodstream
   2. Examples
      a. Direct injection into the bloodstream or vein (intravenous injection)
      b. Injection into a muscle (intramuscular injection)
      c. Injection into subcutaneous tissue or under the skin (subcutaneous injection)
      (Note: In a later unit, we will discuss these and the student will learn how to perform them.)
      d. Administration of drug orally—drug enters the digestive system and eventually the bloodstream
      e. Administration of the drug rectally—drug eventually reaches the bloodstream
      f. Administration of a drug across the respiratory mucosa
   3. Speed of absorption (listed in order)
      a. Intravenous injection
      b. Transtracheal injection
      c. Rectal injection
      d. Intramuscular injection
      e. Subcutaneous injection
      f. Oral injection
E. Distribution—method by which a drug is distributed to the body—usually through the bloodstream or body fluid
F. Detoxification—process by which the body inactivates a drug (often in the liver)

G. Elimination
   1. Process whereby a drug is eliminated or sent out from the body by some or all of the excreting organs
   2. Examples
      a. Skin
      b. Urinary bladder
      c. Lungs
      d. Bowels

2.3. Terms used to describe nature of drug action

A. Depression—decreased power of the cells to function (e.g., morphine depresses the central nervous system)
B. Physiological—action caused by the drug when given in the concentrations normally present in the body (applies only to drugs derived from normal body chemicals)
C. Therapeutic—beneficial action of a drug to correct a dysfunction
D. Untoward reaction—side effect regarded as harmful to the patient
E. Irritation—action that produces slight or temporary damage to tissue
F. Antagonism—opposition or contrariety, as between muscles, medicines, or organisms
G. Cumulative action—action of suddenly increased intensity, may be evidenced after administration of several doses of a drug
H. Tolerance—progressive diminution of susceptibility to the effects of a drug, resulting from its continued administration
I. Synergism—the joint action of agents so that their combined effect is greater than the algebraic sum of their individual effects
J. Potentiation—the combined action of two drugs, being greater than the sum of the effects of each used alone
K. Additive—characterized by addition
L. Habituation—a condition resulting from the repeated consumption of a drug, with a desire to continue its use, but with little or no tendency to increase the dose; there may be psychic, but no physical dependence on the drug, and detrimental effects, if any, are primarily on the individual

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M. Idiosyncrasy—an abnormal susceptibility to some drug, protein, or other agent that is peculiar to the individual

N. Hypersensitivity—having the specific or general ability to react with characteristic symptoms to the application or contact with certain substances (allergens) in amounts innocuous to normal individuals

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2.4. Drugs affecting parts of the body (only brief discussion)

A. Drugs affecting the central nervous system
B. Drugs affecting the autonomic nervous system
C. Drugs affecting the respiratory system
D. Drugs affecting the skeletal and muscular systems
E. Drugs affecting the circulatory system
F. Drugs affecting the urinary system
G. Drugs affecting the digestive system
H. Drugs affecting the reproductive system
I. Drugs affecting the endocrine system
J. Drugs affecting the eyes
K. Drugs affecting the skin and mucous membranes
L. Others
    1. Hallucinogenic drugs
    2. Histamines, antihistamines, and drugs for motion sickness
    3. Antibiotics and chemotherapeutic agents
M. Classification is useful
    1. As the program progresses, we will learn about the drugs as a given body system is covered.
    2. To help you understand how drugs work, we will discuss drugs affecting the autonomic nervous system.
        a. These are the drugs you will probably be using in the field.
        b. The autonomic nervous system influences the function of many body organs.

2.5. Drugs affecting the autonomic nervous system

(Note: Have students (in class) read Chapter 4, section entitled "Drugs Affecting the Autonomic Nervous System," of the *Text*. After they have completed the reading assignment,

answer any questions. The following outline is provided only for the instructor's convenience.)

A. Purpose of autonomic nervous system (review)
   1. Parasympathetic nervous system
      a. Vegetative function
      b. Vagus nerves
      c. Chemical mediator—acetylcholine
      d. Example: heart reaction to acetylcholine
      e. Drug
         (1) Atropine
         (2) Parasympathetic blocker
   2. Sympathetic nervous system
      a. Function—stress
      b. Norepinephrine—chemical mediator
      c. Example: heart reaction to norepinephrine
      d. Others (hormone)
         (1) Adrenal gland—adrenalin
         (2) Epinephrine

B. Drugs influencing the sympathetic nervous system
   1. Point out that these are classified according to receptors (use switch mechanism).
   2. Discuss alpha and beta receptors/agents.
   3. Discuss their effects.
      a. Alpha
         (1) Heart—no effect
         (2) Arteries—constriction
         (3) Lungs—none or mild bronchoconstriction
      b. Beta
         (1) Heart—increased rate, increased force, increased automaticity
         (2) Arteries—dilatation
         (3) Lungs—bronchodilation
   4. Point out that some drugs are both alpha and beta, thus will tend to have both effects.
   5. Discuss sympathetic blockers.
      a. Point out that they block the action of sympathetic agents.
      b. Point out that they occupy receptors so that agents cannot act.
      c. Give an example (e.g., propranolol—beta blocker).

NOTES

2.6. Certain things to understand and look for when studying a drug

- A. Dose
  - 1. Usual dose
    - a. Adult
    - b. Infant
  - 2. Precision in computation (covered in next unit)
  - 3. Patient history
    - a. Allergies
    - b. Prior medication
    - c. Physical problem
- B. Dilution (amount and type)
- C. Action
  - 1. Physiological
  - 2. Therapeutic
- D. Indications and uses
- E. Precautions
  - 1. Is the drug lethal?
  - 2. How should the patient be monitored?
- F. Contraindications
  - 1. Should not be administered to pregnant women
  - 2. Others
- G. Incompatibility with other drugs
- H. Side effects
- I. Antidotes

2.7. Summary

- A. Site of location
  - 1. Local
  - 2. Systemic
- B. Influencing factors
  - 1. Age
  - 2. Condition
  - 3. Dosage
  - 4. Absorption rate
  - 5. Distribution
  - 6. Elimination
- C. Special terms
  - 1. Depression
  - 2. Physiological

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3. Therapeutic
4. Untoward reaction
5. Irritation
6. Antagonism
7. Cumulative action
8. Tolerance
9. Synergism
10. Potentiation
11. Additive
12. Habituation
13. Idiosyncrasy
14. Hypersensitive

D. Different ways to classify drugs

E. Autonomic nervous system
   1. Parasympathetic
   2. Sympathetic
      a. Alpha
      b. Beta
      c. Blockers

F. Things to know about drugs
   1. Dose
   2. Dilution
   3. Action
   4. Indications and use
   5. Precautions
   6. Contraindications
   7. Incompatibility
   8. Side effects
   9. Antidotes

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UNIT 3

emt-p

WEIGHTS AND MEASURES

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Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

3.2.1.K The student should be able to list the two systems of weights and measures being used today.

3.2.2.K Given a list of units (weights and volume), the student should be able to tell which ones belong to the apothecary system or the metric system.

3.2.3.K The student should be able to list at least three advantages of the metric system.

3.3.1.K Given a list of numbers in milligrams, the student should be able to convert the measures to grams.

3.3.2.K Given a drug dose in milligrams and the specific concentration of a drug in tablet form, the student should be able to calculate how many tablets should be given.

3.3.3.K Given a list of measures in grams, the student should be able to convert the measures to milligrams.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

3.3.4.K Given a list of measure in milliliters, the student should be able to convert the measures to liters.

3.4.1.K Given a desired dose and the concentration of the drug, the student should be able to calculate the volume of the drug to be administered.

3.5.1.K Given weight in pounds, the student should be able to convert the measure into kilograms.

3.5.2.K Given a weight of a patient in pounds and a drug dose in milligrams per kilogram (mg/kg), the student should be able to calculate the appropriate drug dose for the patient. (E.g., a 150-pound man is to receive 0.01 mg/kg of atropine—how much atropine should be given?)

Instructor Activities

Assign the material referred to below during the class period before the beginning of this unit. Assignments are:

- Chapter 4, Unit 3, of the *Text*
- Knowledge objectives for this unit

Prepare a lecture following the content outline on page IV-28. The following are suggestions:

- Inform the students that there are no demonstration sessions and no practice sessions, and that there is a homework exercise in the metric system.
- Inform the students that the unit is primarily designed for them to learn about the metric system and to calculate dosages in the metric system. Further inform the students that they should become familiar enough with the conversions and the metric system to work the problems in the field.
- Discuss Section 3.2 of the content outline by using the lecture method.
- Do not cover Section 3.3 of the content outline if the class, as a group, understands decimals. If you, as an instructor, are uncertain about the knowledge level of the group in reference to decimals, it might be advisable for you to administer a pretest.

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This pretest could be administered in the class period before this unit.

If there is a need to devote some class time to decimals, then a lecture might be given. If so, be sure to give the students problems as you work through this section of the content outline. You may even want some of the students to go to the blackboard. (This will help you assess their understanding of the material being covered.)

If you feel a lecture would be too time consuming, there is a useful reading assignment for the students in the *Text.* This reading assignment is designed to give the students an understanding of decimals as well as practice in solving some simple problems. This reading, followed by a lecture, might be more efficient than a straight lecture.

The remainder of Section 3.3 of the content outline deals with converting metric units to other metric units. This section can also be discussed by having the students work on simple problems as you progress through the outline.

- Discuss drug concentrations as outlined in Section 3.4. You can present the formula and have the students work on some problems.
- Discuss Section 3.5, which is a summary. Some new material, however, is added in this section (converting pounds to kilograms). This was not discussed previously because some students may not know how to divide when the dividend is a decimal.
- Ask the students to work on the student exercise after they complete the unit. Before the next class period, it is suggested that the class review the problems.

Evaluate the students on their attainment of the objectives in this unit at the end of the module.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Equipment—Medical

None

Materials

Knowledge objectives (optional)
Text
Exercise assignment

Content Outline

3.1. Introduction

A. Review: In the last unit we discussed the effects of drugs and we listed these factors that influence the action of drugs:
   1. Age of the patient
   2. Condition of the patient
   3. Dosage
   4. Absorption
   5. Distribution
   6. Elimination

B. Point out that in this unit, weights and measures (the metric system) will be reviewed so the students can determine and understand dosages.
   1. Have the students review the knowledge objectives for this unit.
   2. Explain that they will have homework problems dealing with the metric system.

3.2. Two systems

A. Discuss the apothecaries system (brief discussion only)
   1. Solid measures (weight limits)
      a. Grain
      b. Scruple
      c. Dram
      d. Ounce
      e. Pound
   2. Liquid measures (fluids—volumes, units)
      a. Minim
      b. Fluidram

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c. Fluidounce
d. Pint
e. Gallon

3. Additional comment—most apothecaries use the metric system.

B. Discuss the metric system

1. Advantages
   a. It is the most frequently used system in the official listing of drugs.
   b. The system is very logical and organized.
   c. There are pressures for the United States to use the metric system.
2. Solid (weight unit)
   a. Primary unit is the gram (g).
   b. Secondary unit (i.e., a unit derived from primary unit) is the milligram (mg).
3. Liquid (volume—capacity)
   a. Primary unit is the liter (l).
   b. Secondary unit is the milliliter (ml).

C. Discuss the exchange or conversion of units from the metric system to the apothecary system or vice versa. The conversions are usually approximations only. The only conversion you may encounter in the field is converting pounds to kilograms.

1. Kilo means 1,000 (one thousand, not thousandth)
2. A kilogram is 1,000 grams
3. To convert pounds to kilograms, divide pounds by 2.2 to get kilograms

3.3. Metric system

A. Decimals (review)—this review may not be necessary depending on the knowledge level of the class—see *Text*

1. Point out that decimals are based on the number 10 (or some power of 10)—for example, 100, 1,000, 10,000, where $100 = 10 \times 10$ (or 10^2), $1{,}000 = 10 \times 10 \times 10$ (or 10^3), $10{,}000 = 10 \times 10 \times 10 \times 10$ (or 10^4). As you increase, you are multiplying by 10 (e.g., $100 = 10 \times 10$; $1{,}000 = 100 \times 10$; $10{,}000 = 1{,}000 \times 10$).

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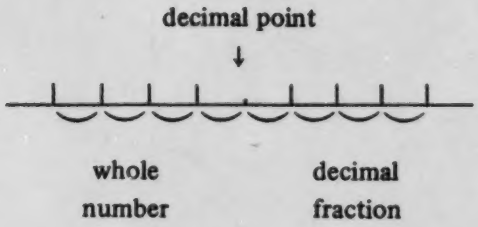
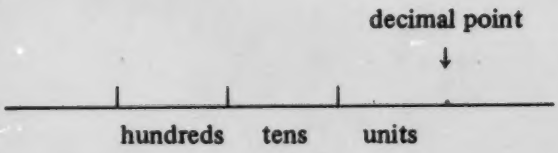
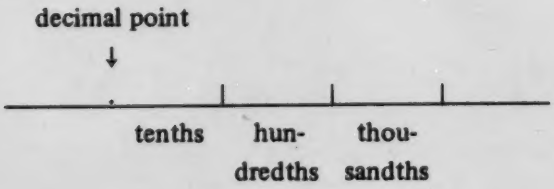
2. Give examples (just list).
   a. 0.5
   b. 0.05
   c. 0.005
   d. 0.0005
   e. 2.50
   f. 4.50
   g. 4.251
3. Point out the parts of a decimal.
   a. Whole number (number before the decimal point)
   b. Decimal point
   c. Decimal fraction (number after the decimal)



4. Discuss the place value of whole numbers and decimal fractions:



for example, 485 = four *hundred* and eighty (*tens*) five (*units*)



.6 = six tenths = $\frac{6}{10}$

.07 = seven hundredths = $\frac{7}{100}$

.008 = eight thousandths = $\frac{8}{1000}$

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a. Point out that the place value (or position) of the number in relationship to the decimal point gives the number its place name. (E.g., if two places to the right of the decimal, it will have a place name in the hundredths.) The number .14 is 14 hundredths or 14/100; .757 is seven hundred and fifty seven thousandths or 757/1,000.

b. Point out that to eliminate the confusion of overlooking the decimal point and reading the decimal fraction as a whole number, a zero is placed to the left of the decimal when there is no whole number (e.g., 0.14).

c. Give an example—ask students to read 14.14 or 14 14/100 (fourteen and fourteen hundredths).

5. Discuss the annexing or adding of zeros to the right of the decimal fraction.

a. Example—ask students to read 0.5 (5 tenths).

b. Example—ask students to read 0.50 (50 hundredths); however, 0.5 = 0.50 or 5/10 = 50/100.

c. Adding zeros to the right of the decimal fraction does not change its value

6. Discuss the adding and subtracting of decimals.

a. Rule—line up the decimal points and annex the zeros to the right of the decimal fraction.

b. Example—addition

$$\begin{array}{rr} 1.5 & 1.50 \\ +\ 21.65 & 21.65 \\ \hline & 23.15 \end{array}$$

c. Example—subtraction

$$\begin{array}{rr} 23.15 & 23.15 \\ -\ \ 1.5 & \ \ 1.50 \\ \hline & 21.65 \end{array}$$

7. Explain how to multiply decimals.

a. General—the multiplication of decimal numbers is done in exactly the same way as the multiplication of whole numbers, except the decimal point is placed in the product.

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b. Rule—count the number of decimal places in the numbers to be multiplied and count from the right of the product to locate the decimal point.

	125	12.5
	X .5	X .5
product =	62.5	6.25

1.25	.125
X .5	X .5
.625	.0625

c. Give examples.

12.5	1.25	.125
X 10	X 10	X 10
125.0	12.50	1.250

(Ask the students if they see a simple pattern to follow)

d. Rule—when multiplying a decimal by 10, just move the decimal point one place to the right.

e. Give examples.

12.5	1.25	.125
X 100	X 100	X 100
1250.0	125.00	12.500

(Ask the students if they see a simple pattern.)

f. Rule—when multiplying a decimal by 100, just move the decimal point two places to the right.

g. General rule—when multiplying a decimal by a multiple of 10, just move the decimal point to the right by the number of zeros found in the multiple. (E.g., 1,000 has three zeros; so if we multiplied 1.25 by 1,000, we would move the decimal point three places to the right, 1250.0.).

8. Explain how to divide decimals.

a. Dividing decimals is the same as dividing whole numbers, except you must keep track of the decimal point.

b. Brief review of division with whole numbers

c. Example:

(1) $24 \div 4 = 6$, where 24 is the dividend, 6 is the divisor, and 4 is the quotient or answer, or

$$4 \overline{)24}$$
$$6$$

(2) With decimals (example where dividend is a decimal)

$$4 \overline{)2.4}$$
$$.6$$

keep decimal point in quotient above decimal point in dividend

d. Rule—divisor must always be a whole number, so in the problem

$$0.4 \overline{)2.4}$$

make 0.4 a whole number by moving the decimal point one place to the right. The decimal point in the divisor cannot be moved without moving the decimal point in the dividend, so make 2.4, 24.0; thus, our problem becomes

$$4 \overline{)24.0}$$
$$6.0$$

Remember to keep the decimal point in the quotient above the new location of the decimal point in the dividend.

e. Another example:

$$0.4 \overline{)24}$$

Moving the decimal points in the divisor and dividend, we have

$$4 \overline{)240.0 \text{ or } 60.0}$$

NOTES

f. Examples for dividing by a multiple of 10

$$10 \overline{)5.0} \quad 0.5$$

$$10 \overline{)0.50} \quad 0.05$$

$$10 \overline{)0.050} \quad 0.005$$

(Ask the students if they see a pattern.) Rule: when dividing a decimal by 10, move the decimal point one place to the left; when dividing a decimal by 100, move the decimal point two places to the left.

Note: it is the opposite of multiplication.

B. Metric units

1. Review (from previous discussion).
   a. Primary units—grams
   b. Secondary unit—milligrams
2. Point out that secondary units are derived from primary units.
   a. Milli means thousandths, therefore a milligram (mg) is one-thousandth of a gram (g) or there are 1,000 mg in 1 g 1/1000 g = 1 mg or 0.001 g = 1 mg.
   b. You are dividing one by 1,000 so you move the decimal point three places to the left.
3. Demonstrate how to convert milligrams to grams.
   a. Discuss the following problem: if there are 1,000 mg in 1 g, and I have 2,000 mg, how many grams do I have? Answer = 2 g or

$$1000 \overline{)2000.0} \quad 2.0$$

or, to divide 2,000 by 1,000, just move the decimal point three places to the left

   b. Give more problems—for example, convert the following to grams (student exercise)

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2,000 mg = 2.0 g
2,500 mg = 2.5 g
2,750 mg = 2.75 g
500 mg = 0.5 g
75 mg = 0.075 g

c. Give the students this problem: suppose a physician orders 1,000 mg of a certain drug and that the drug is dispensed in 0.5 g tablets. How many tablets should be given?

Convert milligrams to grams (1 g); divide 1 g by the concentration in the tablets

$$\frac{1\text{ g}}{0.5\text{ g}} = 2 \text{ tablets}$$

General formula:

$$\frac{\text{dosage desired (in grams or milligrams)}}{\text{dosage on hand (in grams or milligrams)}}$$

where both dosages are in the same units

$$0.5\overline{)1.0}\quad 2.0$$

(Give other similar problems as homework.)

4. Demonstrate how to convert grams to milligrams.
   a. Point out that if we can change milligrams to grams by moving the decimal point three places to the left, we can logically change grams back to milligrams by moving the decimal point three places to the right. (I.e., to change grams back to milligrams, all we need to do is multiply by 1,000.)
   b. Give some problems:

0.01 g = 10 mg
0.357 g = 357 mg
0.0002 g = 0.2 mg
2.507 g = 2,507 mg

NOTES

c. Give the following example: the physician orders 0.5 g of a specific drug in capsule form. The label on the bottle reads 250 mg per capsule. Since 0.5 g is equal to 500 mg, you should give the patient 2 capsules.

5. Discuss liters and milliliters: if milli means thousandth, then milliliters (ml) mean one-thousandth of a liter (l) (i.e., there are 1,000 ml in 1 l).
   a. Converting milliliters to liters:

      1,000 ml = 1 l
      2,000 ml = 2 l
         20 ml = 0.020 l
      3,750 ml = 3.75 l

      Rule: just move the decimal point three places to the left.
   b. Converting liters to milliliters

      1 l = 1,000 ml
      2.5 l = 2,500 ml
      6.75 l = 6,750 ml
      .002 l = 2 ml

      Rule: just move the decimal point three places to the right.
6. Discuss cubic centimeters (cc) (relationship between liters, grams, and centimeters).
   a. Relationship: 1 ml of water weighs 1 g and occupies 1 cc of volume. Thus, 1 ml and 1 cc both express one-thousandth of a liter.
   b. Problem:
      Suppose that you were going to give a patient 0.5 ml of a drug, and your syringe was graduated in cc's. How far back would you pull the plunger?

      Answer: Since milliliters and cubic centimeters are both thousandths, the plunger would be pulled to the mark reading 1/2 cc (1/2 ml occupies 1/2 cc).

NOTES

3.4. Drug concentration (liquids)

A. Proper dosage depends on the concentration of the drug (i.e., how many milligrams of medicine per cubic centimeter (volume) of liquid).

B. Example: Suppose you are instructed to give 20 mg of a drug that is in 10 mg/cc in concentration. How many cc's should be administered?

General formula:

$$\frac{\text{desired dose (mg)}}{\text{concentration on hand (mg/cc)}} = \text{cc to be administered}$$

desired dose = 20 mg
concentration = 10 mg/cc

$$\frac{20 \text{ mg}}{10 \text{ mg/cc}} = 2 \text{ cc}$$

C. Another example: Suppose you are instructed to give 20 mg of a drug that is in 10 mg/1/2 cc in concentration. How many cc's should be administered?

$$\frac{20 \text{ mg}}{10 \text{ mg/5 cc}} = 1 \text{ cc}$$

3.5. Summary

A. Two systems
   1. Apothecary
   2. Metric

B. Metric system
   1. Primary units
   2. Secondary units
   3. Grams, milligrams; liters, milliliters; cubic centimeters
   4. Conversion of milligrams to grams or milliliters to liters: move the decimal point three places to the left

5. Conversion of grams to milligrams or liters to milliliters: move the decimal point three places to the right
6. Milliliters and cubic centimeters both express one-thousandth of a liter; milliliter is a liquid weight and cubic centimeter is a volume measure

C. Conversion of pounds to kilograms
1. Point out that it is the division of pounds by 2.2 to get kilograms
2. Give example: a 220-pound man weighs 100 kilograms

$$2.2 \overline{)220.0} \quad 100.$$

D. Drug concentrations
1. Tablets/solids
   a. $\frac{\textit{Dose desired}}{\text{Dose in hand}}$
   b. Where both are in the same unit
2. Liquid
   a. $\frac{\textit{Dose desired}}{\text{Dose in hand}}$ unit weight / unit weight/unit volume
   b. Where both are in the same unit weight

NOTES

Student's name _____

Sample Student Exercise

Instructions: Complete the following table:

1. 0.5 g = __ mg
2. 500 mg = __ g
3. 0.0004 g = __ mg
4. 5.2 mg = __ g
5. 1.0 l = __ ml
6. 1,000 ml = __ l
7. 2,505 ml = __ l
8. 2,752 l = __ ml

Instructions: Answer the following questions—do your calculations in the spaces provided.

9. A physician wishes to replace 2 liters of fluid lost by vomiting and diarrhea. If a bottle of intravenous fluid contains 1,000 ml, how many bottles should the patient receive to replace the fluid?

10. You are instructed to give a patient 0.015 g of a certain drug and the drug is dispensed in tablets of 5 mg each. How many tablets should you give him? (Hint: First convert grams to milligrams.)

11. A patient has taken four tablets of a drug, each containing 5 mg. How many grams of the drug has he taken?

12. How many kilograms does a 150-pound patient weigh?

13. A patient is given 2.5 ml of drops, four times daily. How many cc's of medication is he receiving daily?

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If each 2.5 ml contains 100 mg of medication, how many grams of the drug is he receiving daily?

14. A patient is supposed to receive 1.25 mg of a drug, three times a day. If the drug is in liquid form and 4 cc contains 0.626 mg, how many cc's should he receive for each dose?

15. You are instructed to administer 20 mg of a drug that comes with a concentration of 10 mg/cc. How many cc's should you administer?

16. You are instructed to administer 30 mg of a drug that comes with a concentration of 15 mg/0.5 cc. How many cc's should you administer?

17. You are instructed to administer 0.5 g of a drug that comes in a concentration of 50 mg/cc. How many cc's should you administer? (Hint: Convert grams to milligrams first.)

18. You are instructed to administer 0.08 g of a drug that comes in a concentration of 80 mg/0.5 cc. How many cc's should you administer?

19. A patient weighs 220 pounds. You are instructed to administer 0.5 ml of an intravenous fluid for each kilogram. How many milliliters should you administer?

How many cubic centimeters should you administer?

20. A patient weighs 176 pounds. You are instructed to give 0.0005 mg of a drug for each kilogram. If the drug comes in a concentration of 0.02 mg/0.5 cc, how many cc's should he receive?

NOTES

UNIT 4

ADMINISTRATION OF DRUGS

NOTES

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

4.2.1.K The student should be able to list at least four methods of administering drugs.

4.3.1.K The student should be able to list at least eight safety considerations to remember when administering drugs.

4.4.1.K The student should be able to list or otherwise describe the local guidelines for administering drugs. (Note: The instructor may specify additional objectives concerning local procedures.)

Instructor Activities

Assign the material referred to below during the class period before the beginning of this unit.

- Chapter 4, Unit 4, of the *Text*
- Knowledge objectives for this unit. (Note: The instructor may want to write additional objectives concerning the local guidelines in administering drugs.)

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

NOTES

Prepare a lecture following the content outline below. (Note: It is suggested that the instructor expand the section of the outline concerning the local policies or guidelines in administering drugs.) The following are suggestions:

- Inform the students that there are no demonstration sessions, no practice sessions, and no homework assignments or student exercises.
- Briefly discuss Section 4.2 of the content outline as a review of Unit 2 of this module (Action of Drugs). Ask the students if they can recall the methods by which drugs can be absorbed into the body.
- Discuss Section 4.3 of the content outline by using a lecture/discussion method.
- Discuss Section 4.4 of the content outline by using a lecture/discussion method also. In this section, be sure to inform the students of any and all local guidelines.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Equipment—Medical

None

Materials

Knowledge objectives (optional)
Text

Content Outline

4.1. Student exercise review from Unit 3

4.2. Introduction to administration of drugs (review of Unit 2)

A. Point out that in Unit 2, we discussed the factors that influenced the action of drugs. One of those factors was

absorption rates. At that time, we discussed some methods of administration:

1. Direct injection into the blood stream (IV injection)
2. Injection into a muscle (intramuscular injection)
3. Injection into subcutaneous tissue under the skin (subcutaneous injection)
4. Oral administration
5. Rectal administration
6. Transtracheal administration

B. Discuss the speed of absorption, listed in order:
   1. IV injections
   2. Transtracheal, rectal administrations
   3. Intramuscular injections
   4. Subcutaneous injections
   5. Oral administrations

C. Point out that in the next unit, we will demonstrate the techniques of:
   1. IV injections
   2. Intramuscular injections
   3. Subcutaneous injections

D. Point out that the purpose of this unit is to discuss some important safety considerations.

4.3. Safety considerations and procedures

A. Steps or guidelines in administering drugs
   1. Concentrate on the task (stress the importance of avoiding errors—stress the consequences of making errors).
   2. Make sure you have clearly indicated the situation to the command physician (e.g., patient history).
      a. Allergies
      b. Prior medications
      c. Physical problems
   3. Make sure you understand the physician's orders—if in doubt, do not proceed until there is an understanding.
      a. Drug
      b. Dose
      c. Method of administration
   4. Repeat orders back to physician to confirm before administering a drug.

NOTES

5. Read labels carefully.
   a. Drug name
   b. Drug concentration
   c. *Never use the contents of an unlabeled container.*
6. Double-check all calculations before administering (especially for prepackaged drugs)
   a. Fractional dose
   b. Do all the necessary conversions.
7. Use correct, properly operating equipment.
8. Handle drugs (medications) carefully to avoid dropping or breaking.
9. Exercise aseptic procedures.
10. Check incompatibility problems.
    a. Drug will not mix with another drug or solution.
    b. If a solution looks cloudy rather than clear or if particles like snowflakes appear, do not administer the drug without first checking with a doctor. If cloudiness or precipitation occurs after the drug is injected into the IV tubing, stop the infusion and change the tubing.
11. Monitor the symptoms of overdose and take corrective measures, as necessary.

4.4. Local guidelines for the administration of drugs

NOTES

UNIT 5 emt-p

TECHNIQUES OF ADMINISTRATION

NOTES

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

5.3.1.K Given a list of reasons, the student should be able to select the reason why ampules' top should be tapped before they are used.

5.3.2.K Given a list of reasons, the student should be able to select the reason why air must be taken into the syringe when drawing a solution from a vial.

5,4.1.K Given a list of reasons, the student should be able to select the reason why the IV tube is pinched off above the injection site when performing an IV push.

5.4.2.K Given a list of either advantages or disadvantages, the student should be able to select the advantages or disadvantages of:

- IV injections
- Subcutaneous injections
- Intramuscular injections

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

5.4.3.K Given a list of reasons, the student should be able to select the reason why the skin is pinched when administering a subcutaneous injection.

5.4.4.K Given a list of reasons, the student should be able to select the reason why the skin is stretched when administering an intramuscular injection.

Skill Objectives

After completing the module, the student should be able to correctly perform each of the skill objectives. "Correctly" will be defined by the instructor. Skill evaluation sheets are included in the module.

5.3.1.S Given a vial or ampule of medication, alcohol wipes or alcohol sponge, a file, and a syringe (with a needle), the student should be able to withdraw a given amount of the solution, given the dose, from either an ampule or vial.

5.3.2.S Given a prepackaged syringe (Bristojet), the student should be able to assemble the unit.

5.4.1.S Given a prepackaged syringe (Bristojet), alcohol wipes, and IV already established, the student should be able to perform an IV push and inject a specified dose of medication into the IV container.

5.4.2.S Given a fellow student as a victim, a syringe (with a needle and already containing medication—sterile water), and alcohol wipes, the student should be able to perform subcutaneous and intramuscular injections when the location is specified by the instructor or evaluator.

Instructor Activities

Assign the skill and knowledge objectives for this unit during the class period immediately before the beginning of the unit.

In the class period immediately prior to this one, inform the students they will be tested on the knowledge objectives at the end of

NOTES

this unit. This written test will cover the material (objectives) discussed in Units 1–5.

Prepare a written test (using the knowledge objectives from each unit).

At the beginning of this unit, inform the students that there will be demonstration sessions and practice sessions. The demonstrations consist of:

5.3.1.S Withdrawing solutions
5.3.2.S Withdrawing solutions using a prepackaged set
5.4.1.S IV push and adding medication to IV container
5.4.2.S Subcutaneous and intramuscular injections

Prepare the lecture and demonstrations following the content outline and demonstration outline on pages IV-48 and IV-52. The following are suggestions:

- Section 5.2 of the content outline can be presented during a lecture. Be sure to have a syringe for each student to look at while you describe the syringe and how to read the scale. When discussing the types of syringes, have them available for the student to examine. Ask the students if they can list the advantages and disadvantages of each type.
- Section 5.3 of the content outline can be presented during a demonstration and lecture. When describing vials, ampules, and cartridges, have them available for the students to examine. At the end of this section, if possible, have the students attend Practice Session 1 (withdrawing solutions).
- Section 5.4 of the content outline can be presented during a lecture and demonstration. If a film describing the importance of skill in injections, reasons for injections, and step-by-step procedures for preparation and site selection is available, it may be used at this time. Note: The students should engage in Practice Session 2 before subcutaneous and muscular injections are presented or demonstrated. After demonstrating subcutaneous and intramuscular injections, the students should attend Practice Session 3. As an alternative, Practice Sessions 2 and 3 can be combined.

Test the students. After the students have had sufficient time to practice the skills, they should be given a written test to determine

NOTES

their attainment of all the knowledge and skill objectives contained in this module.

NOTES

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Equipment—Medical

Vials and ampules of medication (sterile water) (one for each student plus two for demonstration purposes)
Prepackaged syringe and cartridges (one for every student plus two for demonstration purposes)
Disposable syringes (with needles) (four per student plus four for demonstration purposes)
Alcohol wipes (minimum of four per student)
File (one for every two students plus two for demonstration purposes)
Alcohol sponges (one for every student plus two for demonstration purposes)
IV administration set with Y injection site and site at IV container (one for every two students plus one for demonstration purposes)

Materials

Knowledge objectives (optional)
Skill objectives
Knowledge test
Skill evaluation sheets

Content Outline

5.1. Introduction

A. Purpose of the unit
1. To present and demonstrate the techniques of drug administration
a. Drawing up medications from vials and ampules

b. Intravenous injections
c. Intramuscular injections
d. Subcutaneous injections
e. Addition of medications to IV bottles

5.2. Syringe and scales

A. Description (have a syringe for each student to look.)
1. The barrel (has the scale printed on it; it also contains or houses the medication)
2. The plunger (head is usually buttonlike)
3. The hub (which the needle fits into)

B. Description of the scale; ask students to:
1. Hold the syringe in a horizontal position.
2. Roll the syringe gently around until the scale is seen.
3. Review the scale markings (location and meaning of each marking). You may even want students to manipulate the plunger to the different markings. Be sure to explain markings between any larger markings.
4. Briefly discuss the different size of scales (e.g., 2 and 2–1/2 cc).

C. Different types of syringes (try to have available for students)
1. Glass—advantages and disadvantages
2. Plastic disposable
a. Point out that it is in a sterilized, sealed package with protective covering on the needle.
b. Advantages and disadvantages
3. Prepackaged syringes (Bristojet)
a. Discuss operation (draw diagram).
b. Discuss how to put them together.
c. Discuss advantages and disadvantages.
d. Discuss the bolus (prepackaged medication).

5.3. Withdrawal of medications from vials and ampules. (Have vials, ampules, and cartridges available for students to see.)

A. Three containers
1. Vials
a. Have an example available.
b. Read the label and drug concentration.

NOTES

c. Point out that it is vacuum sealed.
d. Discuss precautions to take when breaking off the top.

2. Ampules
   a. Have an example available.
   b. Read the label and drug concentration.
   c. Point out that it is not vacuum sealed.
   d. Discuss the types.
   e. Explain how to remove medication from the top.
3. Bolus (cartridge—prepackaged)
   a. Have an example available.
   b. Read the label and concentration.

B. Demonstrations
1. 5.3.1.S (vials and ampules)
2. 5.3.2.S (prepackaged)

C. Practice Session 1

5.4. Routes of administration

A. IV injections (assume IV setup operational)
1. Point out that it is given directly into vein
   a. Explain procedure, purpose, dangers (briefly)
   b. Explain Y injection site
   c. Explain direct injection technique with hypodermic.
2. Directly into IV container
   a. Briefly explain procedure and purpose
   b. Describe injection site at container
3. Introduce Demonstration 5.4.1.S (IV push and adding medication to IV container).
4. Introduce Practice Session 2.

B. Subcutaneous injections and intramuscular injections
1. Define each one.
2. Discuss absorption rates.
3. Discuss the location site for each.
   a. Subcutaneous (upper arm and thigh)
   b. Intramuscular (gluteus maximus and thigh.)
4. Briefly describe the differences in injection methods (size of needles, amount of medication for each site, etc.).

NOTES

5. Introduce Demonstration 5.4.2.S.
6. Introduce Practice Session 3.

5.5. Summary

A. Different types of syringes
B. Withdrawal of medications
C. Intravenous injections
D. Subcutaneous injections
E. Intramuscular injections

NOTES

Demonstration 5.3.1.Sa: Withdrawing a Solution in a Vial

NOTES

Equipment

Vial of medication
Alcohol wipes
Syringe with needle

Procedure

Make sure all the students can see the motion and movements.
Describe what you are doing as you do it.
Tell the students to watch and listen. (They should not be writing or trying to duplicate your actions as you perform the skill.)
Discuss the critical errors that could be made at every step.

Steps

1. Prepare or make ready a syringe (if required).
2. Check the vial.
   a. Carefully read the label for the proper name.
   b. Carefully note the concentration of the drug (mg/cc).
3. Compute the dosage.
   a. Be precise.
   b. Have an example of a fractional dose.
4. Cleanse the rubber stopper with an alcohol wipe.
   a. Explain how and demonstrate.
   b. Explain why.
5. Pull air into the syringe equal to the amount of solution to be withdrawn.
   a. Explain how and demonstrate.
   b. Explain why. Minimizes pressure change in medicine's container.
6. Insert the needle through the rubber stopper.
   a. Explain how and demonstrate.
   b. Explain the possible errors.
   c. Explain how to avoid errors.
   d. Explain how to hold the barrel.
7. Inject air into the vial.
   a. Explain how and demonstrate.
   b. Explain why.

8. Invert the vial and withdraw the desired amount of medication.
   a. Explain how and demonstrate.
   b. Explain why.
9. Check the label on the vial and the dosage of medication withdrawn—explain why.
10. Protect the needle from contamination.
    a. Explain how and demonstrate.
    b. Explain why.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Demonstration 5.3.1.Sb: Withdrawing a Solution from an Ampule

NOTES

Equipment

Ampule of medication
File
Alcohol sponge
Syringe with needle

Procedure

Make sure all students can see the motion and movements.

Describe what you are doing as you do it.

Tell the students to watch and listen. (They should not be writing or trying to duplicate your actions as you perform the skill.)

Discuss the critical errors that could be made at every step.

Steps

1. Prepare the syringe (if required).
2. Check the ampule.
   a. Carefully read the label for the proper name.
   b. Carefully note the concentration of the drug (mg/cc)
3. Compute the proper dosage.
   a. Be precise.
   b. Have an example of a fractional dosage.
4. Lightly tap or shake the ampule.
   a. Explain how.
   b. Explain why (dislodge the solution from the neck of the ampule).
5. Scratch the neck of the ampule with a file (unless the ampule has a colored line around the neck).
   a. Explain how.
   b. Demonstrate.
6. Place an alcohol sponge around the neck of the ampule and break off the tip.
   a. Explain how and demonstrate.
   b. Explain why it is necessary to discard the alcohol sponge and tip.

7. Insert the needle into the solution without touching it to the edges of the ampule.
   a. Explain how and demonstrate.
   b. Explain why.
8. Draw the solution into the syringe.
   a. Explain how and demonstrate.
   b. Point out difference between the ampule and the vial in this maneuver.
9. Check the label on the ampule and the dosage—explain why.
10. Protect the needle—explain why.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Demonstration 5.3.2.S: Bolus and Prepackaged Syringe

NOTES

Equipment

Prepackaged syringe (Bristojet) and bolus

Procedure

Demonstrate so all the students can see the motion and movements.

Describe what you are doing as you do it.

Tell the students to watch and listen. (They should not be writing or trying to duplicate your actions at this time.)

Steps

1. Check the label on the bolus or cartridge for the drug name.
2. Note the concentration (mg/cc).
3. Pop off the protective caps from the syringe barrel and the bolus (medication cartridge) with your thumbs.
4. Screw the cartridge into the syringe barrel.
5. Remove air from syringe.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

Demonstration 5.4.1.Sa: Administering an IV Push (IV Bolus)

NOTES

Equipment

Prepackaged syringe (Bristojet) with bolus or cartridge of medication
IV administration set (with Y injection site)
Alcohol wipes

Procedure

Set up the IV before the demonstration session.
Make sure all the students can see what you are doing.
Tell the students to watch and listen. (They need not take notes.)
Describe what you are doing as you do it.
Describe critical errors at each step.

Steps

1. Describe the situation to the students—IV set, point out the Y entry.
2. Prepare the prepackaged syringe.
   a. Check the drug name on the cartridge or bolus.
   b. Check the concentration.
   c. Pop off the protective caps.
   d. Screw the cartridge and barrel together.
3. Expel air from the syringe by pointing the needle upward.
   a. Explain and demonstrate how.
   b. Explain why expelling the air is important.
4. Cleanse the gum rubber stopper or gum rubber sleeve with an alcohol wipe.
   a. Explain and demonstrate how.
   b. Explain why.
   c. Explain why you should not inject into the plastic tubing (not self-sealing).
5. Puncture the stopper or sleeve with the needle—explain and demonstrate how.
6. Inject the medication.
   a. Explain and demonstrate—pinch off the IV tubing above the injection site and explain why.

b. Emphasize administrating the prescribed amount and not always the entire bolus.

7. Withdraw the needle.
   a. Explain and demonstrate how.
   b. Explain how a needle should be discarded.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Demonstration 5.4.1.Sb: Addition of Drugs into an IV Bottle or Bag

NOTES

Equipment

IV administration set (with injection site on the fluid container)
Alcohol wipes
Prepackaged syringe (Bristojet) with bolus or cartridge of medication

Procedure

Have the IV set up before demonstration begins.
Make sure all the students can see.
Describe as you demonstrate.
Tell the students to just watch and listen (they need not take notes).

Steps

1. Describe the situation to the students—IV set (point out the injection site on the fluid container). Explain why injections might be given this way.
2. Prepare the prepackaged syringe.
   a. Check the drug name on the cartridge or bolus.
   b. Check the concentration.
   c. Pop off the protective caps.
   d. Screw the cartridge and barrel together.
3. Cleanse the gum rubber stopper or gum rubber sleeve with alcohol wipes.
   a. Explain and demonstrate how.
   b. Explain why.
   c. Explain that they are self-sealing.
4. Puncture the stopper or sleeve with the needle. Explain and demonstrate how to:
   a. Position the hands
   b. Position the barrel and needle
5. Inject the medication. There is no need to pinch off the tubing.
6. Withdraw the needle and discard.
   a. Explain and demonstrate how.
   b. Explain why.

7. Ask the students to explain the differences between adding medicine to an IV bottle and IV push, and the differences in procedures, rate of absorption, etc.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Demonstration 5.4.2.Sa: Subcutaneous Injections

NOTES

Equipment

Syringe (with 25-gage needle)
Ampule of medication (sterile water)
File
Alcohol sponge
Alcohol wipes
Volunteer (student)

Procedure

Select a student volunteer.
Demonstrate so all the students can see motion and movements.
Describe the steps and movements as you demonstrate.
Tell the students to watch and listen (they need not take notes).

Steps

1. Review the procedures for withdrawing a solution from an ampule (see Demonstration 5.3.2).
   a. Prepare the syringe.
   b. Read the label (name and concentration).
   c. Compute the proper dosage.
   d. Tap the ampule.
   e. Break off the tip.
   f. Insert the needle.
   g. Draw out the solution.
   h. Recheck the label (name, concentration, and dose).
   i. Protect the needle from contamination.
2. Select the site for injection.
   a. Review places for subcutaneous injections.
   b. Explain why sites are selected and used.
3. Cleanse the site with alcohol wipes.
   a. Explain and demonstrate how (circular motion going out).
   b. Explain what may be used (alcohol or iodine).
4. Remove the cap from the syringe needle.
5. Remove air from the needle.
   a. Explain and demonstrate how.
   b. Explain why.

6. Pinch the skin.
   a. Explain and demonstrate how this is done for any site (location of hands, etc.).
   b. Explain why.
   c. Do not contaminate.
7. Insert the needle into the injection site.
   a. Explain and demonstrate how the syringe is held, the angle of entry, the forces used, the depth inserted, etc.
   b. Explain possible errors.
   c. Explain how to avoid possible errors.
8. Draw back on the plunger to make certain you have not entered a blood vessel.
9. Slowly push the plunger.
   a. Explain and demonstrate how.
   b. Explain that the patient may experience pain if you push too fast or too slow.
10. Withdraw the needle quickly.
    a. Explain and demonstrate how.
    b. Explain possible errors and discomfort for the patient.
11. Apply direct pressure over the injection site with a wipe.
    a. Explain and demonstrate how.
    b. Explain why the site should not be rubbed.
12. Dispose of equipment—explain why.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors. (If this is the case, have another set of equipment ready.)

NOTES

Demonstration 5.4.2.Sb: Intramuscular Injections

NOTES

Equipment

Syringe (with 22-gage needle)
Ampule of medication (sterile water)
File
Alcohol sponge
Alcohol wipes
Volunteer (student)

Procedure

Select a student volunteer.

Have the solution already drawn from the ampule (specify the name and concentration).

Demonstrate so that all the students can hear and see.

Describe the steps and procedures as you demonstrate.

Tell the students to watch and listen (they need not take notes).

Steps

1. Explain that the solution has already been drawn from the ampule.
2. Select a site for injection.
   a. Review the possible locations for injections.
   b. Explain why certain sites are selected and used.
   c. Explain the difference from subcutaneous injection sites.
3. Cleanse the site with wipes.
   a. Explain and demonstrate how.
   b. Explain that it is no different than subcutaneous injections.
   c. Explain the need to avoid contamination.
4. Remove the cap from the needle.
5. Remove air from the needle—explain how and why.
6. Stretch the skin at the location site.
   a. Explain and demonstrate how (location of the hands and fingers, technique for stretching).
   b. Explain why the skin is stretched (explain the difference from subcutaneous injections).

7. Insert the needle in the site.
   a. Explain and demonstrate how the syringe is held, the angle of entry, force used, depth inserted.
   b. Explain possible errors.
   c. Explain how to avoid possible errors.
8. Draw back on the plunger to make certain the needle has not entered a blood vessel.
9. Slowly push the plunger.
   a. Explain and demonstrate how.
   b. Explain the consequences of pushing too fast or too slow.
10. Quickly remove the needle.
   a. Explain and demonstrate how (location of the hands on the syringe, angle, etc.).
   b. Explain possible or common errors.
   c. Explain how to avoid possible or common errors.
11. Apply direct pressure over the injection site.
   a. Explain and demonstrate how.
   b. Explain what can be used.
12. Dispose of the needle or equipment.

NOTE: After the demonstration, ask the students if they have any questions or if they would like to see part of the demonstration repeated. Depending on the approach and schedule, the instructor may want the students to practice at this time or at least have one student repeat the demonstration, with the instructor talking the student through the skill, pointing out the errors.

NOTES

Practice Session 1

Equipment

Ampule of medication (sterile water) (one for each student)
Vial of medication (sterile water) (one for each student)
Alcohol wipes (two for each student)
Alcohol sponges (one for each student)
File (one for each group of students)—depending on type of ampule
Syringe (with needle) (one for each student)
Prepackaged syringe (Bristojet) with bolus of medication (one for each student)

Skills

5.3.1.S Withdrawing a Solution from a Vial or Ampule
5.3.2.S Using a Prepackaged Set

Procedure

Divide the students into groups of two.
Let each student in the group practice the skills.
Students should be allowed to help other students.

Practice Session 2

Equipment

Prepackaged syringe (Bristojet) (two for every student) or disposable syringe (with needles) and a vial or ampule of medication (with all necessary material for their use) (one for every student)
IV unit already set up (with Y injection site) and injection site into the container (one for each group of students)
Alcohol wipes (enough for class)

Skills

5.4.1.S IV Push and Adding Medication to an IV Container

NOTES

Procedure

Divide the students into groups of two.
Have them practice the skill(s).
Have the students assist one another.

Practice Session 3

Equipment

1-cc syringe with 22- or 25-gage needle (either prepackaged or disposable) (two for each student)
Medication (sterile water) (one container for each student)
Alcohol wipes (two for every student)

Skill

5.4.2.S Subcutaneous and Intramuscular Injections

Procedure

Divide the class into groups of two.
Have them practice the skill(s).
Have the students help each other.

NOTES

Student's name_____

Date_____

Pass 1 2 3

Fail 1 2 3

NOTES

Skill Evaluation 5.3.1.S: Withdrawing a Solution from a Vial or Ampule

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence or omitted. The student should be given three attempts to perform the skill.

Equipment

Vial
Ampule
Alcohol sponge
Alcohol wipe
Syringe (with needle)
File

Procedure

Place all the necessary equipment in front of each student.

Give the student the name of the drug to be administered and the dosage. (Note: You may want various vials and ampules with different drug names or the same drug with different concentrations.)

Inform the student that this evaluation may occur as part of Skill 5.5.2.S.

Steps

___ ___ ___ A. Select the proper drug name and/or concentration.

___ ___ ___ B. Prepare the vial or ampule.

___ ___ ___ 1. If a vial, cleanse the rubber stopper with alcohol.

NOTES

___ ___ ___ 2. If an ampule

___ ___ ___ Tap

___ ___ ___ Scratch the neck with a file

___ ___ ___ Break off the tip with an alcohol sponge

___ ___ ___ Protect your fingers

___ ___ ___ Discard the tip and alcohol sponge

___ ___ ___ C. Insert the needle into the solution.

___ ___ ___ 1. If a vial

___ ___ ___ Pull air into the syringe

___ ___ ___ Insert through the rubber stopper

___ ___ ___ Inject air into the vial

___ ___ ___ 2. If an ampule, insert the needle into the solution without touching the edge.

___ ___ ___ D. Draw the solution into the syringe.

___ ___ ___ 1. If a vial, invert the vial and withdraw the desired amount.

___ ___ ___ 2. If an ampule, withdraw the desired amount.

___ ___ ___ E. Check the label and desired dosage.

___ ___ ___ F. Protect the needle.

Student's name_____

Date_____

Pass 1 2 3

Fail 1 2 3

NOTES

Skill Evaluations 5.3.2.S and 5.4.1.S: Using a Prepackaged Set, and the IV Push and the Addition of Medication into an IV Container

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Prepackaged syringe (Bristojet) with bolus or cartridge
Disposable plastic syringe
Ampule or vial
File
Alcohol sponges
Alcohol wipes

Procedure

Have the IV set up with a Y injection site and an injection site on the fluid container.

Inform the student that the purpose of the evaluation is to have him demonstrate the skill of an IV push and the addition of medication to a container of IV fluid.

Inform the student that he must perform both skills to pass.

Steps—IV Push

___ ___ ___ A. Prepare prepackaged syringe, checking the name and concentration, and put the unit together.

NOTES

___ ___ ___ B. Expel air from the syringe by removing the needle cover, pulling back slightly on the plunger, and then pushing the plunger in slightly to squeeze out the air.

___ ___ ___ C. Cleanse the gum rubber stopper or gum rubber sleeve with an alcohol wipe

___ ___ ___ D. Puncture the stopper or sleeve with the needle at the Y injection site.

___ ___ ___ E. Inject the proper amount of medication by pushing on the plunger and at the same time, pinch off the IV tubing above the injection site.

___ ___ ___ F. Withdraw the needle and dispose of properly.

Ask the student the following question: Why is it necessary to pinch off the IV tubing above the injection site?

Steps—Addition of Drugs or Medications to IV Bottle or Bag

___ ___ ___ A. Prepare a prepackaged syringe, checking the name and concentration and put it together.

___ ___ ___ B. Cleanse the gum rubber stopper or gum rubber sleeve with an alcohol wipe.

___ ___ ___ C. Puncture the stopper or sleeve with the needle at the injection site of the bottle or bag.

___ ___ ___ D. Inject the proper amount of medication by pushing the plunger.

___ ___ ___ E. Withdraw the needle and dispose of it.

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluation 5.4.2.S: Subcutaneous and Intramuscular Injections

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Syringe filled with sterile water (needle)
Alcohol wipes

Procedure

Use a fellow student as a patient.

Inform the student that he must perform both skills (inform the student of the order and injection site).

Inform the student that he may assume the medication concentration and name are given.

Steps—Subcutaneous Injections

___ ___ ___ A. Prepare the injection site using a circular motion (inform the student of the injection site).

___ ___ ___ B. Remove the cap from the needle (if applicable).

___ ___ ___ C. Remove air from the needle by slightly pushing the plunger.

___ ___ ___ D. Pinch the skin around the injection site.

___ ___ ___ E. Insert the needle into the injection site at a 45° angle.

NOTES

NOTES

___ ___ ___ F. Withdraw the plunger slightly to ascertain there is no blood return.

___ ___ ___ G. Slowly push the plunger.

___ ___ ___ H. Withdraw the needle quickly.

___ ___ ___ I. Apply direct pressure over the injection site with a wipe.

___ ___ ___ J. Dispose of the material and equipment.

Steps—Intramuscular Injections

___ ___ ___ A. Prepare the injection site using a circular motion.

___ ___ ___ B. Remove the cap from the needle.

___ ___ ___ C. Remove air from the needle by pushing the plunger slightly.

___ ___ ___ D. Stretch the skin.

___ ___ ___ E. Insert the needle into the site at a 45° angle.

___ ___ ___ F. Withdraw the plunger slightly to ascertain there is no blood return.

___ ___ ___ G. Slowly push the plunger to deliver the desired amount of medication.

___ ___ ___ H. Withdraw the needle quickly.

___ ___ ___ I. Apply direct pressure over the injection site with a wipe.

___ ___ ___ J. Dispose of materials and equipment.

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